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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,594	01/16/2004	Yi-Nan Su	61994.00007	8697

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EXAMINER

DANG, TRUNG Q

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 11/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/759,594

Applicant(s)

SU ET AL.

Examiner

Trung Dang

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 1, 9, 12, 14, 15, and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Lee et al. (US 6,607,984).

With reference to Figs. 7-12, Lee teaches 18.A method for forming a self aligned trench isolation, said method comprising:

providing a semiconductor substrate having a pad nitride layer 111 thereon and openings therein, wherein a capacitor is formed in the interior of said opening of said semiconductor substrate;

conformally forming a hard mask layer 124 on said pad nitride layer and said

capacitor (Fig. 8 and col. 6, lines 13-15);
forming a dielectric layer on said hard mask layer (col. 6, lines 29-30 in conjunction with col. 5, lines 12-24);
forming a pattern photoresist layer **130** on said dielectric layer;
removing parts of said dielectric layer, said hard mask layer, said pad nitride layer and said semiconductor substrate, with a part of said dielectric layer as a mask, to form a trench in the middle between partial said two capacitors, wherein a removing rate between said dielectric layer and said hard mask layer is different (Fig. 11 and col. 2, lines 40-42; col. 5, lines 41-43).

Note that, although not shown in Fig. 8, a dielectric layer of SiO₂ is formed on the bottom antireflecting (BARC) layer **124** (col. 6, lines 29-30 in conjunction with col. 5, lines 12-24) and then the patterned photoresist layer is formed on the SiO₂ dielectric layer. At the step corresponding to the disclosure in col. 6, lines 51-53, the removal of the patterned photoresist layer **130** leaves the SiO₂ dielectric layer intact because the photoresist layer **130** is removed selective to the SiO₂ dielectric layer (col. 5, lines 16-18), and the composite layer of SiO₂ /BARC is used as a mask to etch shallow trench isolation (STI) region **132**.

For claim 9, see col. 5, lines 63-65 for the limitation regarding the buried strap.

For claim 12, Fig. 9 shows the photoresist layer **130** defines an active area (area exposed by the resist) and a device area (area covered by the resist), and the resist mask **130** is aligned with the deep trenches **118**.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2-4, 8, 11, 17-18, 21-22, 24-25, 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al as above in view of Wensley et al. (US 6,566,227).

Lee teaches a process as noted above. Lee differs from the claims in not disclosing that the STI region **132** is filled with an isolation comprises an oxide as well as the depths of the deep trench and the shallow trench. Wensley teaches filling STI region with an oxide (col. 6, lines 9-12). Wensley also teaches the depths of the deep trench (DT) and shallow trench (ST) in a DRAM device are about 6 to 10 microns (col. 4, lines 34-35) and about 3,600 Å (col. 5, line 56), respectively. It would have been obvious to one of ordinary skill in the art to modify Lee's process by filling the shallow trench with SiO₂ and forming the DT and ST having depths as

noted above because such features are commonly known in the art as shown by Wensley, and the employment of a known practice to make the same would have been within the level of one skilled in the art.

For claims 11, 17, 24, and 28 the determination of the thickness of the BARC hard mask layer with respect to the opening and the rate of selectivity between the SiO₂ dielectric layer and the BARC hard mask layer would have been obvious to one having ordinary skill in the art since it has been held that, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable range by routine experimentation. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Kulling, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and In re Geisler, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997).

5. Claims 5-7, 10, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art in view of Lee et al. cited above.

The admitted prior art depicted in Figs. 1A-1D and described in the pending specification in pages 2-3 teaches substantially the claimed invention, including process steps regarding the forming of the doped buried layer, the diffused lower electrode, and the CMOS transistor fabricated in the device area. The admitted prior differs from the claims in the step of etching STI region 114, which utilizes a composite hard mask layer comprises a SiO₂ layer formed on a BARC layer as an

etch mask to etch the STI region 114. Lee teaches a process in which a STI region is etched using a composite hard mask layer of SiO₂/BARC as an etch mask for the etching, wherein a removing rate between said SiO₂ layer and said BARC layer is different (Fig. 11 and col. 2, lines 40-42; col. 5, lines 41-43). Also see the teaching of Lee as noted in the above 102 rejection. It would have been obvious to one of ordinary skill in the art to modify the process of the admitted prior art by employing the Lee's technique in the step of forming the STI region 114 because the use of the composite hard mask taught in Lee would provide better lithographic critical dimension control, and hence reducing mask misalignment.

6. Claims 19, 20, 23, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art taken with Lee et al. as applied to claims above, and further in view of Wensley et al. cited above.

The combination of the admitted prior art and Lee teaches the process as noted above. The combined process differs from the claims in not disclosing that the STI region 114 is filled with an isolation comprises an oxide. Wensley teaches filling STI region with an oxide (col. 6, lines 9-12). It would have been obvious to one of ordinary skill in the art to modify Lee's process by filling the STI region 114 with SiO₂ because an isolation region formed of SiO₂ is commonly practiced in the art as shown by Wensley, and the employment of a known process to make the same would have been within the level of one skilled in the art.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Trung Dang whose telephone number is 571-272-1857. The examiner can normally be reached on Mon-Friday 9:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Trung Dang
Primary Examiner
Art Unit 2823



11/01/04